AMENDMENTS TO THE SPECIFICATION

Please replace the first paragraph on page 1 with the following amended paragraph:

The present invention relates to a control unit for an electric power steering apparatus for applying a steering assist force by a motor to a steering system of an automobile or a vehicle and especially to a control unit for an electric power steering apparatus for carrying out detection of a ~~rotating~~rotational direction of a motor and the like with low-cost sensors.

Please replace the paragraph bridging pages 3 and 4 with the following amended paragraph:

With this method of detecting the abnormality of the rotation angle sensor and the abnormality of the Hall element 216 which is the position detecting sensor, only the abnormal condition of the Hall element 216 which is the position detecting sensor is detected, so a ~~rotating~~ rotational direction when the Hall element 216 is operating normally cannot be detected. Moreover, processing takes much time in referring to a table of criteria of judgment for judging whether the sensors are abnormal or normal, because a plurality of conditional statements are used. Moreover, because both the rotation angle sensor and the Hall element 216 are used, an abnormality judging processing becomes complicated.

Please replace the first full paragraph on page 4 with the following amended paragraph:

The present invention has been made with the above-described circumstances in view and it is an object of the invention to provide a control unit for an electric power steering apparatus

with which, by using simple position detecting sensors such as the Hall sensors, it is possible to judge ~~at one time~~ an abnormality of ~~rotating~~rotational direction detection ~~and~~or a ~~rotating~~rotational direction when the ~~rotating~~rotational direction detection is normal in a short processing time and it is possible to detect a steering wheel relative steering angle by using information about the obtained ~~rotating~~rotational direction.

Please replace the paragraph bridging pages 4 and 5 with the following amended paragraph:

The present invention relates to a control unit for an electric power steering apparatus for applying a steering assist force by a motor to a steering system of a vehicle. To achiever the above object of the invention, the control unit comprises: a plurality of position detecting sensors for detecting a rotation position of the motor and outputting it as binary outputs; a state function calculating means which calculates a output value of a state function for every predetermined time by inputting outputs of the plurality of position detecting sensors to the state function; and a judging means to be input the output values of the state function which respectively continued through the predetermined time, so as to judge a ~~rotating~~ rotational direction of the motor ~~and~~ or abnormality of ~~rotating~~ rotational direction detection of the motor ~~at one time~~.

Please replace the first full paragraph on page 5 with the following amended paragraph:

Furthermore, to achieve the above object of the invention, the state function is a function the output value of which is in a one-to-one relationship with the rotation position of the motor without redundancy or the control unit comprises relative steering angle calculating means for converting each of the clockwise rotation, the counterclockwise rotation, and the stop obtained from the ~~rotating~~ rotational direction into a numerical value and integrating the numerical value every predetermined time to calculate a steering wheel relative steering angle or a column relative steering angle. Moreover, to achieve the above object of the invention, the control unit comprises steering velocity calculating means for calculating a steering wheel steering velocity or a column steering velocity by using the steering wheel relative steering angle or the column relative steering angle and the predetermined time.

Please replace the first full paragraph on page 6 with the following amended paragraph:

FIG. 2 is a block diagram showing an example of prior-art detection of an abnormality of motor ~~rotating~~ rotational direction detection.

Please replace the fourth full paragraph on page 6 with the following amended paragraph:

FIG. 5 is a drawing showing a relationship between a ~~rotating~~ rotational direction of the motor and the state value S_n.

Please replace the fifth full paragraph on page 6 with the following amended paragraph:

FIG. 6 is a drawing showing relationships among state values S_n, S_{n+1} before and after a predetermined time, the ~~rotating~~ rotational direction, and the abnormality of the ~~rotating~~ rotational direction detection.

Please replace the sixth full paragraph on page 6 with the following amended paragraph:

FIG. 7 is a drawing showing relationships among state values S_n, S_{n+1}, the ~~rotating~~ rotational direction, and abnormality of the ~~rotating~~ rotational direction detection with abnormalities of the Hall sensors in view.

Please replace the eighth full paragraph on page 6 with the following amended paragraph:

FIG. 9 is a flow chart showing an example of processing for judging the motor ~~rotating~~ rotational direction and the abnormality of the ~~rotating~~ rotational direction detection according to the invention.

Please replace the second full paragraph on page 9 with the following amended paragraph:

FIG. 5 is a drawing for making relationships between CW and CCW which are the ~~rotating~~ rotational directions and the output value of the state value S_n easy to understand and shows the relationship between the ~~rotating~~ rotational direction of the motor and the state value S_n. It can be understood from FIG. 5 that a relationship of movement from a certain state value S_n to another state value S_{n+1} is fixed. For example, if the state value S_n is "1", then the value certainly moves to "3" in a case of the direction CW while moves to "5" in a case of the direction CCW. Therefore, the state value S_n does not directly move from "1" to "2", "4", or "6" and such movement is regarded as abnormal.

Please replace the paragraph bridging pages 9 and 10 with the following amended paragraph:

A relationship of a change of the state value S_n from a certain time point to the next time point is shown in FIG. 6. FIG. 6 shows a relationship between a state value S_{n-1} which is an output value of the state function S at a certain time point and the next state value S_n. In FIG. 6, if the state value S_{n-1} at a certain time point is "1" and the next state value S_n is "3", the ~~rotating~~ rotational direction is CW and therefore "CW" is indicated in a position of a point of intersection of the state value S_{n-1} and the state value S_n in FIG. 6. If the next state value S_n is "5", the ~~rotating~~ rotational direction is CCW and therefore "CCW" is indicated in a position of a point of intersection of the state value S_{n-1} and the state value S_n. Here, if the state value S_{n-1} is "1" and

the state value S_n is "1", this represents a stop of rotation in which the motor does not rotate and is at a standstill in the same position and therefore "0" is indicated in a position of a point of intersection of the state value S_{n-1} and the state value S_n. Incidentally, if the state value S_{n-1} is "1" and the state value S_n is "2", "4", or "6", this represents an abnormality and therefore "E" is indicated.

Please replace the last paragraph on page 10 with the following amended paragraph:

FIG. 7 means that the ~~rotating~~ rotational direction of the motor and abnormality of ~~rotating~~ rotational direction detection of the motor can immediately be judged if a state value S_n at a certain time point and a state value S_{n+1} at the next time point are obtained. This relationship is defined as in an expression (2).

Please replace the first full paragraph on page 11 with the following amended paragraph:

According to the expression (2), rotation in the direction CW is output as "1", rotation in the direction CCW is output as "-1", a stop of rotation is output as "0", and the detection abnormality E is output as "127" as the output value X, because the relationship of the rotation in the direction CW, the rotation in the direction CCW, the stop of rotation, or the detection abnormality is known from the relationship in FIG. 7 if the state value S_{n-1} at a certain time point and a state value S_n at the next time point are obtained. Therefore, it is possible to immediately

recognize the ~~rotating~~ rotational direction of the motor or abnormality of ~~rotating~~ rotational direction detection of the motor by seeing the output X.

Please replace the last full paragraph on page 15 with the following amended paragraph:

The above are theoretical description of judgment of the abnormality of the ~~rotating~~ rotational direction detection ~~and~~ or the ~~rotating~~ rotational direction when the ~~rotating~~ rotational direction detection is normal ~~at one time~~, and theoretical description of calculation of the steering wheel relative steering angle R_A, the column relative steering angle R_B, the steering wheel steering velocity Vh, and the column steering velocity Vc.

Please replace the second full paragraph on page 16 with the following amended paragraph:

FIG. 8 is a control block diagram for judging the abnormality of the ~~rotating~~ rotational direction detection ~~and~~ or the ~~rotating~~ rotational direction when the ~~rotating~~ rotational direction detection is normal ~~at one time~~ by inputting the outputs of the Hall sensors.

Please replace the last paragraph on page 16 with the following amended paragraph:

The configuration includes the Hall sensors HS1, HS2, and HS3 disposed in the motor, state function calculating means 11 to which the outputs of the sensors are input, and judging means 12 to which an output of the state function calculating means 11 is input. The judging

means 12 is further formed of storage means 12-1 and a judgment table 12-2. The storage means 12-1 stores the state value S_n which is the output of the state function calculating means 11 and outputs the state value S_{n-1} of a state one step before the processed step to the judgment table 12-2. The state value S_n and the state value S_{n-1} are input to the judgment table 12-2 and the table 12-2 outputs the judgment value X. The judgment table 12-2 is a table for judging the ~~rotating~~ rotational direction and the abnormality of the ~~rotating~~ rotational direction detection shown in FIG. 7.

Please replace the second full paragraph on page 18 with the following amended paragraph:

It is an excellent effect of the invention that the ~~rotating~~ rotational direction of the motor and the abnormality of the ~~rotating~~ rotational direction detection can be detected ~~at one time~~ without using a conditional statement by using the table. The output of the rotation detection abnormality can be utilized for performing failsafe processing corresponding to the abnormal state.

Please replace paragraph bridging pages 18 and 19 with the following amended paragraph:

First, the steering wheel steering angle A_n and the column steering angle B_n are calculated by a relative steering angle counter 13. The calculating procedure will be described by reference to the flow chart in FIG. 8. First, the CW rotation, the CCW rotation, the stop of rotation which are the ~~rotating~~ rotational directions of the motor are converted into numerical

values. In the present embodiment, the judgment table 12-2 carries out detection of the ~~rotating~~ rotational direction and conversion of the ~~rotating~~ rotational direction into the numerical value simultaneously. The CW rotation, the CCW rotation, and the stop of rotation are converted into "1", "-1", and "0", respectively. In other words, X takes on any one of "1", "-1", and "0" (step S11). Next, the numerical value X continues to be added every predetermined time, i.e., at every step to calculate the integrated value C_{nt}. In other words, an expression, $C_{nt}=C_{nt}+X$ is performed and, as a result, X is integrated to calculate the integrated value C_{nt} (step S12).

Please replace the paragraph bridging pages 20 and 21 with the following amended paragraph:

As described above, with the control unit of the electric power steering apparatus of the invention, by converting the ~~rotating~~ rotational direction of the motor into the numerical value and integrating the numerical value in every step, the steering wheel relative steering angle R_A and the column relative steering angle R_B can be obtained. Based on the calculated steering wheel relative steering angle R_A and column relative steering angle R_B, the steering wheel steering velocity Vh and the column steering velocity Vc can also be calculated. Because an absolute steering angle is not especially calculated, it is possible to calculate the steering wheel relative steering angle, the column relative steering angle, the steering wheel steering velocity, and the column steering velocity with a simple algorithm.

Please replace the first full paragraph on page 21 with the following amended paragraph:

Furthermore, with the control unit of the electric power steering apparatus of the invention, by inputting the outputs of the plurality of position detecting sensors to the state function calculating means to form the state function, it is possible to easily and judge the ~~rotating~~ rotational direction of the motor ~~and~~ or the abnormality of the ~~rotating~~ rotational direction detection ~~at one time~~ with the judging means for judging the change from the previous state function to the new one before and after the predetermined time and with the simple algorithm.

Please replace the second full paragraph on page 21 with the following amended paragraph:

Moreover, by converting the detected ~~rotating~~ rotational direction of the motor into the numerical value and integrating the numerical value every predetermined time, it is possible to accurately calculate the steering wheel relative steering angle and the column relative steering angle without calculating the absolute steering angle and with the simple algorithm. Also, it is an excellent effect that the accurate steering wheel steering velocity and column steering velocity can easily be calculated.

Please replace paragraph bridging pages 21 and 22 with the following amended paragraph:

With the control unit of the electric power steering apparatus according to the invention, by using simple position detecting sensors such as the Hall sensors, it is possible to judge ~~at one time~~ the abnormality of the ~~rotating~~ rotational direction detection ~~and~~ or the ~~rotating~~ rotational direction when the ~~rotating~~ rotational direction detection is normal in a short processing time. Moreover, it is possible to detect the steering wheel relative steering angle by using the obtained information about the ~~rotating~~ rotational direction. Therefore, it is possible to achieve the high-performance electric power steering apparatus at a relatively low cost.